



US Army Corps
of Engineers
North Pacific Division

Salmon Passage Notes

Snake and Columbia River Fish Programs

September 1993

BIOLOGICAL DRAWDOWN TEST

The June 1993 Salmon Passage Notes mentioned that National Marine Fisheries Service (NMFS) and the Corps of Engineers are working with regional experts to design a detailed scenario for a biological drawdown test at one or more of the four lower Snake River dams and reservoirs. Work is progressing on the Draft Environmental Impact Statement (EIS) of various alternatives.

NMFS and the Corps have been working with the Technical Advisory Group (a group of regional representatives from federal and state agencies, interest groups and private individuals), and with the U.S. Fish and Wildlife Service and the Fish Passage Center to design a biological drawdown test. Although the test parameters will not finally be decided until the environmental analysis process is completed, they have been narrowed down as explained below.

Genesis of The Drawdown Idea

The idea of drawing down reservoirs below design operational levels during salmon migration season every year first surfaced at the regional Salmon Summit meetings convened by Senator Hatfield in 1990. It is based on the theory that juvenile salmon experience significant mortalities trying to migrate to the ocean because the flow rate of the rivers has been slowed by the series of reservoirs created behind the dams. The question surfaced at the Salmon Summit: why not lower the

reservoirs during migration periods, thereby reducing the cross-sectional area through which water flows and increasing water velocities to speed juvenile migrations?

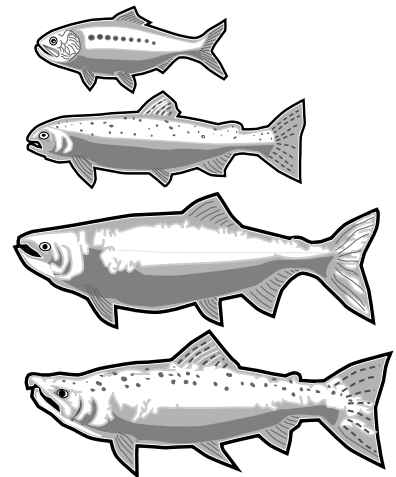
The idea was pursued in the Northwest Planning Power Council's Fish and Wildlife Program Amendments in 1991-1993. When three species of Snake River salmon were listed as threatened or endangered under the Endangered Species Act in late 1991 and early 1992, interest in the concept of reservoir drawdown increased.

The Corps conducted a drawdown test of the Lower Granite and Little Goose reservoirs on the lower Snake River in March 1992 to measure physical impacts of drawdown. The test was purposely conducted when there were few salmon in the river out of concern that a test with migrating fish in the system would have harmful impacts on already troubled salmon stocks.

Biological Drawdown Test Needed

The March 1992 test indicated that modifications could be made to accommodate expected physical and structural impacts of a drawdown. The next step for drawdown testing is to determine biological effects on salmon populations. When one or more reservoirs are lowered do juvenile fish move more quickly through

the system? Do they survive in greater numbers? What about other ecosystem effects? Will predator concentration and water quality be affected? Potential positive and negative impacts to salmon could occur in the reservoirs and at the dams. Faster flows could speed juveniles on their migration, but effects on mortality from spill, the turbines, and even the bypass systems must also be considered.



Factors Affecting The Test Design

When a biological drawdown test was initially proposed, many were hopeful that a test could occur as early as 1994. But in designing a test protocol and examining pre-test requirements, 1996 became the more likely target.

There are several factors affecting the timing, duration, location and type of biological drawdown testing. One is the need for sufficient baseline data against which to measure test results. To effectively measure whether survival of juveniles through the system improves during a drawdown, biologists would first need the juvenile survival rate under normal operating conditions.



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The March 1992 test gave an idea of physical and structural effects of drawdown.

NMFS researchers are conducting a pilot program to tag juveniles and track their progress through the projects, with the first year of baseline data collection planned for 1994. Because conditions in the river such as flow volume can vary widely from year to year and can affect juvenile survival rates, NMFS would like to collect another year of baseline data in 1995, which would push the test date into 1996.

Another factor is the time needed to design, test and construct modifications to the dams to bypass juvenile fish during drawdown and to modify the adult fish ladder exit.

Of the four lower Snake River projects—Lower Granite, Little Goose, Lower Monumental and Ice Harbor—that could be included in a biological drawdown test, Lower Granite has become the likely site for testing. Only Lower Granite is presently equipped to handle adult fish passage at lower than design level elevations, to about a 23-foot drawdown. Although modifications would be needed to accommodate drawdown to 33 or 43 feet, they would be less expensive than installation of an entirely new fish ladder exit. Also, since it is the farthest upstream of the four projects, drawing down only Lower Granite would avoid the problem of lowered tailwater which could affect the adult ladder entrances on the downstream face of a dam.

The juvenile bypass system would also need structural changes to protect juveniles that enter the system during drawdown. Under normal operating conditions many juveniles heading toward the turbine units are deflected upward by guidance screens, where they enter into gatewells. The juveniles move out of the

gatewells through orifices (openings in the concrete) and into channels constructed to bypass them past the dams.

If the reservoir is lowered below minimum operating pool, water levels fall below these orifices and juveniles are trapped in the gatewells. To keep the bypass systems operational during drawdown, a gatewell removal system to collect and remove the juveniles from the gatewells, or facility modifications to lower the orifices and mine a new bypass channel through the dam would be needed.

The adult ladder exit and juvenile gatewell removal modifications could be designed, tested and completed by 1996. Constructing new orifices and a lower level bypass channel, a more permanent change to the dam, potentially could be completed by 1997 (please see related article on page 5).

The drawdown could last from two months for a spring or summer migration season test to four and a half months for a

full spring through summer test. The time it takes to draft and refill the reservoir could add up to one month.

As it is unlikely that one test would provide sufficient information on the effects of drawdown on salmon survival, up to four years of biological testing is under consideration.

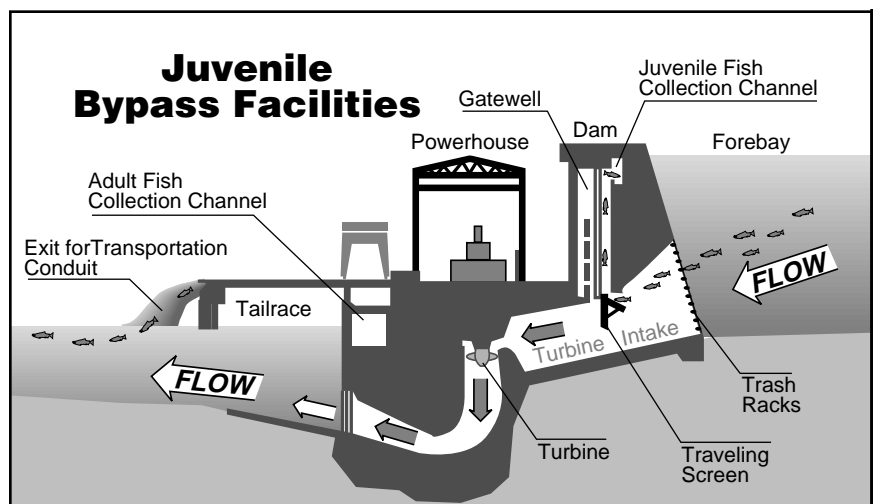
The Bottom Line

Can the region be assured that it will get sound biological information from drawdown testing that will clearly point to or away from annual reservoir drawdown for fish? How many years of tests would be necessary? Fish transport has been in full operation, with much data collected, for over fifteen years and there continues to be debate on the merits of barging fish past the dams. The debate over the merits of drawdown may turn out to be similarly open-ended.

But biological drawdown testing will certainly provide better data than we now have upon which to base crucial decisions about what to do for salmon, and which alternatives for reconfiguring and operating the hydro projects will give the best improvements in salmon runs.

Biological Drawdown Test EIS Information

If you are interested in information concerning the draft EIS, please write to Mr. Pete Poolman at the Corps Walla Walla District, Bldg 602, City-County Airport, Walla Walla WA 99362-9265 or call him at (509) 522-6619.



COUNCIL BRIEFED ON SCS PROGRESS

Drawing down reservoirs at the Snake and Columbia river projects to increase river flows as a means of decreasing juvenile salmon mortality is being considered under two studies of long-term measures: the System Operation Review and System Configuration Study.

At meetings with the Drawdown Committee of the Northwest Power Planning Council on August 10 and the full Council on the 11th, Corps officials reported on the status of the System Configuration Study (SCS), an analysis of economic, environmental and technical/engineering effects of five major alternatives for physically restructuring the Corps dams for fish.

SCS Schedule

The Corps representatives reported that the draft Phase I or reconnaissance-level report would be available for public review by March 1994. The report will provide comparisons of the alternatives under study so that decisions can be made on which alternatives will be evaluated in detail in the second phase of the study.

This report schedule reflects a slip in the original target date of late 1993. One factor in this delay is that progress on the multi-agency Columbia River System Operation Review study has been delayed and the System Configuration Study requires system computer modeling, environmental effects assessments, and economic data being developed in that study. Other factors include agency staff focus on "real time" operation of the Columbia and Snake river system for fish, and responses to legal challenges the Corps and other federal agencies are facing under the Endangered Species Act.

John Day Drawdown

Corps officials also reported on the study of modifications to the John Day project to allow operation at 257 foot elevation, or Minimum Operating Pool. Discussion focused on a recommendation to accelerate the John Day option in advance of the SCS process. While acknowledging a strong interest from some in the region in drawing down John Day as soon as possible, the Corps position is that it must continue to work through the engineering and environmental study process logically, relying on good science.

There is a need to better understand the biological benefits for juvenile fish and the severity of environmental and other impacts before making a decision to implement the 257-foot elevation operation at John Day. Within this framework, the Corps is committed to working with the region and the Council to consider and develop an expedited schedule.

Jim Baker, representing the Sierra Club, addressed the Council and said that making the necessary modifications and operating John Day reservoir at the 257 foot elevation would provide a "best buy" in achieving water velocity improvements in the reservoir. He said that the costs for these modifications, as reported by the Corps, would be much less than the costs of providing flow augmentation. In answer to a question from the Committee, Baker stated that he does not see the John Day option as a substitute for, but rather in addition to, existing flow augmentation measures.

Turbine Modeling Video Shown

The Corps also reported on turbine model studies being done in connection with designing new extended length bypass screens for McNary dam. Video imaging inside the model's scroll case housing its turbine runners showed that severe turbulence in the form of cavitation and water shears occurred in the model when the headwaters and/or tailwaters were lowered below normal operating range. Such conditions could cause high mortality to fish passing through the turbine. Corps officials said that this phenomenon will be investigated further in ongoing engineering/biological studies.

Biological Drawdown Test

The Corps and NMFS briefed the Committee on progress to date on the test design and National Environmental Policy Act (NEPA) activities related to the proposed biological drawdown test. The agencies presented preliminary plans for a reservoir drawdown and biological testing at Lower Granite Dam on the lower Snake River. NMFS is developing the test design and the Corps is evaluating necessary modifications at the dam to enable safe passage for fish during drawdown tests. Time needed to complete design and implementation of structural modifications indicates 1996 is the earliest a full-scale test could be carried out.

NMFS has stated a need to conduct biological testing of drawdown for up to four years to be scientifically and statistically valid. Because permanent modifications of Lower Granite and the other three Lower Snake dams then would take many more years to complete after the biological tests are concluded, drawdown proponents at the meeting expressed concern that any benefit of drawdown may come too late.

Cost estimates

The agencies indicated that prior to proceeding with any of the biological drawdown test alternatives currently under consideration, a modified system for collecting and bypassing juvenile fish must be designed, tested and installed at Lower Granite; modifications to the adult exit system must be designed and completed; baseline data would be collected; and any other necessary facility modifications would be made.

The Corps reported preliminary cost estimates of around \$40 million to

(Continued on next page)

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The John Day project and Lake Umatilla.

WHAT WE HEARD YOU SAY

The Corps and NMFS held a series of public scoping meetings throughout the region May 10 through 17 to introduce the topic of a biological drawdown test to the public and get initial feedback. Comments and questions offered at the meetings came from a variety of quarters and reflected divergent views on the issue.

A number of parties stated a belief that the region already has all the information it needs to proceed with implementation of annual drawdowns of the four lower Snake River reservoirs. They believe drawdowns would guarantee that juveniles will be able to reach the ocean more quickly and that this faster journey will ensure better survival. They state that further study will only waste valuable time and we should not “study the fish to death”.

Others believe the drawdown idea should be dismissed altogether and more effort devoted to other means of saving the salmon, such as improving the juvenile transportation program and making it a permanent part of operations. They say businesses and communities would be hard hit by another drawdown test or annual disruption of navigation operations and recreation opportunities for a two to four month period each spring. They point out that farmers who ship grain down the Columbia-Snake Waterway would have to either store goods during drawdown or use much more costly ground transportation, and that recreational boating, fishing and swimming would be affected.

Some say impacts to resident fish and wildlife communities in the present reservoir habitat should be given full consideration. One commenter said that the Corps promised certain benefits to the communities in return for their backing when the dams were built in the first place and that the needs of these communities should not be ignored.

Still others caution that a biological drawdown test should be very carefully planned so the region will get useful information about the effects of drawdown on the fish populations it is intended to benefit as well as on resident fish and wildlife populations. They state that the region should have reassurance that the drawdown option is feasible for the long term and will bring sufficient returns in numbers of fish before committing the resources necessary even for a biological drawdown test.

The Corps and NMFS are attempting to balance these and other conflicting views and needs in examining the alternatives for a biological drawdown test. Foremost in developing a preferred alternative through the EIS process is the pursuit of sound biological information that will help the region make the best choices for configuring and operating the Federal Columbia River Power System in concert with Endangered Species Act requirements.

EFFORTS FOR SALMON CONTINUE

The Corps and the region continue to devote resources and energies to the search for solutions to the decline of salmon species in the Columbia/Snake river basin.

A new juvenile salmon collection and transport facility at Lower Monumental project began operation this year. This brings the total number of collection projects on the lower Columbia and Snake rivers to four. As of mid-August nearly 15 million juveniles have been transported and 2.9 million more bypassed.

Work progresses at Ice Harbor and The Dalles on designing and installing juvenile bypasses at those projects. Extended-length (forty-foot) submerged screens are being tested for increased efficiency in deflecting juveniles away from the turbine intakes at McNary and Lower Granite dams. They are proving to divert significantly greater numbers of

fish to the bypass systems than the standard length, twenty-foot screens now in place. While there are still bugs to be worked out, the promising results so far support the planned installation of these devices beginning in 1996.

The 1993 target flows for the Columbia and Snake rivers established in consultation with the National Marine Fisheries Service were met through August, thanks in large part to heavy rains in June and the concerted efforts of the federal actions agencies (the Corps, Bonneville Power Administration and Bureau of Reclamation) and others in the region to supply water for flows from upstream storage dams.

To further increase flow velocities, the lower Snake River projects—Lower Granite, Little Goose, Lower Monumental and Ice Harbor—were operated at near minimum operating pool levels through mid-August. The John Day reservoir on the Columbia River was operated at the minimum level at which agricultural irrigation pumps could function.

There was considerable spilling at the projects through the spring and summer migrations to divert juveniles away from the powerhouses and over the spillways—always with an eye on the potential for unacceptably high gas supersaturation (and resulting gas bubble disease in fish) that can occur from too much spill.

The region has high hopes that all of these efforts will help in the overall campaign to preserve and restore declining stocks of anadromous salmonids in the basin.

In the meanwhile, the diligent search continues for potential long-term restoration measures that will bring the salmon runs back to stronger levels.

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Spill at the projects diverts migrating juveniles away from the powerhouses.

THE DALLES BYPASS SYSTEM ENVIRONMENTAL ASSESSMENT

The Corps Portland District is drafting an Environmental Assessment on a proposal to construct a screened juvenile bypass system at the Dalles Dam. The Dalles project on the lower Columbia River currently lacks a screened bypass system. Instead, juveniles are "skimmed" from the reservoir through the ice and trash sluiceway, or pass over spillways or through the turbines.

Congress has directed and the Corps is proceeding with the design and construction of a screened juvenile bypass system at The Dalles. The Northwest Power Planning Council in its Fish and Wildlife Program Amendments recommended that the Corps install juvenile bypass systems at all unscreened federal mainstem dams by 1998. This target is expected to be met with the addition of facilities at The Dalles and Ice Harbor.

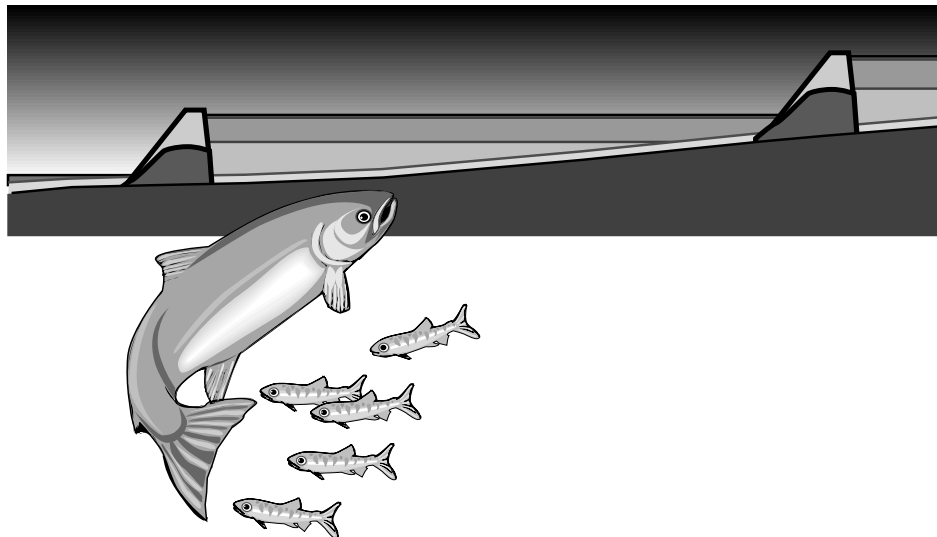
The estimated cost to construct the bypass system at The Dalles is \$121.5 million with operation and maintenance costs estimated at nearly \$5 million annually over its 50-year projected life.

To receive a copy of the Environmental Assessment write to US Army Corps of Engineers, CENPP-PE-RP, Portland District, P.O. Box 2946, Portland OR 97208-2946, or call (503) 326-6995.

LITIGATION UPDATE

The legal challenge over whether to transport juveniles past the dams in barges and trucks continues. In April 1993, requests for a temporary restraining order and preliminary injunction to enjoin the Corps from proceeding with transport in the 1993 operating season were denied in the United States District Court for the District of Oregon. The District Court has now set a hearing for December on a motion for a permanent injunction.

On June 10, the Koocanusa International Coalition filed suit in the United States District Court for District of Montana seeking a temporary restraining



order and preliminary and permanent injunction against the use of water from Libby Dam for salmon smolt migrations. A scheduled hearing on the temporary restraining order was postponed.

The State of Idaho, by letter dated June 11, 1993, notified National Marine Fisheries Service, Bonneville Power Administration, Bureau of Reclamation and the Corps of Engineers of its intent to sue based on the 1993 Federal Columbia River Power System (FCRPS) biological opinion issued by National Marine Fisheries Service.

The Sierra Club Legal Defense Fund, Inc. on behalf of American Rivers, et al. by letters dated August 16 and August 18, 1993, submitted a sixty-day notice of intent to sue these same agencies for violations of the Endangered Species Act concerning 1993 operations of the FCRPS.

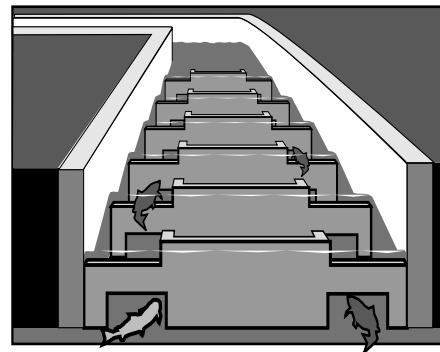
FISH PASSAGE RESEARCH MEETING SET

The Corps of Engineers is holding its annual program review to present 1993 research results of the Fish Passage Development and Evaluation Program (FPDEP). The meeting will be held October 19 from 9:45 a.m. to 5 p.m. at the Walla Walla, Washington District office of the Corps, in the main conference room. The public is invited to attend.

FPDEP study leaders will report on the status and results to date of research for improving adult and juvenile anadro-

mous fish passage at the lower Columbia and Snake river dams. The research categories include survival studies, such as evaluations of Bonneville Dam passage and downstream dissolved gas effects; a study of adult chinook salmon and steelhead migration; transport evaluations and analysis, including studies of stress response, estuary releases, and impacts of bacterial kidney disease; and fish passage efficiency studies, including several evaluations of extended-length juvenile bypass screens.

FOR MORE INFORMATION
contact: Rudd Turner in Portland, Oregon at (503) 326-3829, or Teri Barila in Walla Walla, Washington at (509) 522-6630. The Seventh FPDEP Progress Report summarizing research from 1984-1990 is now available. Please contact Mr. Turner.



(Continued from page 5)

complete facility modifications and implement a biological drawdown test for four and a half months in 1996. For any additional years of drawdown tests, the cost would be around \$10 million per test year for a total of \$70 million for four years of testing. (Since the Council meetings, these numbers have been revised upward.)

These modifications would be of a temporary nature for testing purposes. The Corps told the Committee that if annual drawdowns were to be implemented at Lower Granite on a permanent basis, a different set of modifications would be needed, at an incremental cost of around eight to ten million dollars.

Discussion followed on the pros and cons of two basic options—temporary gateway modifications at Lower Granite dam for testing purposes or the more permanent modifications to mine a lower level bypass channel. Temporary gateway modifications would recognize that we do not yet know if drawdowns will help or harm salmon populations, and would provide the maximum flexibility to test drawdown at various elevations. Bypass channel modifications may prematurely lock us in to a certain drawdown depth but may be a better way to invest limited resources should drawdown prove to benefit salmon populations. Permanent modifications would not dictate that annual drawdowns are required, but may be perceived by some to predetermine that drawdown will be a part of the permanent strategy to save salmon.

The Drawdown Committee asked that the lower level bypass channel option be included in the alternatives examined in the EIS currently being drafted by the Corps jointly with NMFS. NMFS and the Corps agreed to do so, thereby providing the region an opportunity to be heard on the issue.

Salmon Passage Notes is published by the North Pacific Division of the U.S. Army Corps of Engineers.

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Box 2870 Portland, OR 97208-2870

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